

## *VATIS Update Ozone Layer Protection . Nov-Dec 2004*

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## TECH EVENTS

# THE SCIENCE OF OZONE LAYER

## Ozone hole smaller this year

Researchers at the National Institute of Water and Atmospheric Research (NIWA), New Zealand, report that this years ozone hole is 20 per cent smaller than the record-breaking size observed last year. Data obtained from a NASA satellite reveal that the ozone hole peaked at about 24 million km<sup>2</sup> compared with 29 million km<sup>2</sup> in 2003. However, NIWA scientist Dr. Stephen Wood has cautioned against reading too much into this development since natural variations also play a significant role. According to him, smaller and less severe ozone holes over a number of years are required to be certain that the ozone layer is recovering.

Website: [www.ctv.ca](http://www.ctv.ca)

## Enhanced understanding of ozone layers future

In the United States, long-term efforts by scientists at NASA and Hampton University have led to a growing body of evidence suggesting a reduction in ozone depletion. A small sample of their data indicates that the percentage of residual ozone has not declined since 1997. With the Stratospheric Aerosol and Gas Experiment (SAGE) II satellite in orbit for two decades, researchers have been able to chart long-term patterns of the ozone layer and create a baseline to help climate experts predict future changes. After some CFCs were prohibited in the late 1980s and early 1990s, the SAGE project started to record lower levels of ozone depletion. At the present rate, the Antarctic ozone hole could disappear sometime around 2040.

Website: [www.dailypress.com](http://www.dailypress.com)

## Latest update on Antarctic ozone hole

Data on ozone at Halley, Rothera and Vernadsky/Faraday stations are available as of 1 November 2004. The ozone hole grew rapidly from mid-August to early September to reach around 19 million km<sup>2</sup>. It slowly decreased in area from a maximum of 20 million km<sup>2</sup> in mid-September to 15 million km<sup>2</sup> in early October, which is a little below the average size of the last decade. A major spring warming started in mid-October and the area affected decreased to about 10 million km<sup>2</sup>. The lowest ozone values, at around 150 DU, were recorded over East Antarctica and remain over 50 per cent below normal. Ozone values are higher in a broad

band between 60 and 30S, in places near 400 DU.

At Halley, the observing season started in late August. The lowest value recorded this year was 133 DU on 6 October. Values then rose to reach 250 DU (20 per cent depletion) before declining to 240 DU (25 per cent depletion) at the end of the month. At Rothera station the lowest value recorded since the winter solstice was 136 DU on 12 October. Preliminary observations made at Vernadsky suggest that ozone values generally fell from around 280 DU at the beginning of August (15 per cent depletion) to around 170 DU by late September (50 per cent depletion). The lowest value recorded following the winter solstice was 154 DU on 22 September.

Website: [www.antarctica.ac.uk](http://www.antarctica.ac.uk)

## WMO bulletin on ozone

The 14 October bulletin released by the World Meteorological Organization (WMO) reports that the ozone hole decreased in size by about 25 per cent from its maximum size in mid-September. Ground-based measurements of column ozone in Antarctica indicate a wide station-to-station variability. Balloon ozone sonde measurements at South Pole continue to reveal low column ozone values, but now show that the layer that was very depleted in ozone two weeks ago may be starting to recover. Satellite measurements of total column ozone indicate that the area with values over 30 per cent below normal is about 19 million km<sup>2</sup> while the area depleted at least 50 per cent in ozone is about two million km<sup>2</sup>. UV levels at all monitoring stations in and near Antarctica, under the United States National Science Foundation, were typical of those observed during early October in recent years. The ozone hole has decreased in size by about 25 per cent from its maximum size in mid-September, and is presently centred over the Weddell Sea.

Contact: Dr. Michael Proffitt

E-mail: [MProffitt@wmo.int](mailto:MProffitt@wmo.int)

Website: [www.meteo.bg](http://www.meteo.bg)

## ODS PHASE-OUT IN INDIA

### Methyl bromide phase-out

India had been producing methyl bromide (MB) at one plant in Gujarat, which never worked at full capacity. A maximum of 150 t was being produced against the facility's total capacity of 300 t. MB is a registered pesticide in the form of a formulation with 2 per cent chloropicrin, which is added as a lachrymatory agent warning against toxic effect from accidental leakages. Owing to the non-availability of chloropicrin, this formulation is not being produced any more. The plant at Gujarat has been closed for about a year.

MB is not employed in the country for agricultural purposes or for fumigating stored grains. Only conventional pesticides coupled with integrated pest management techniques are employed. For grain preservation, phosphine has been used from the beginning. MB is used only for quarantine and pre-shipment purposes. Though the use of MB for fumigating export products has increased, for which no accurate data exists to date,

it is exempt from Protocol measures. As India is a signatory to the Copenhagen Amendment, efforts are on to quantify total MB usage.

Website: [www.ozonecell.com](http://www.ozonecell.com)

## Award for frost-free refrigerator

Electrolux Indias innovative frost-free refrigerator was awarded the Good Design Award by the Chicago Athenaeum: Museum of Architecture and Design, of the United States. The ergonomically designed O-zone model has a sleek exterior and offers the worlds first, life nourishing features. Developed and manufactured at the state-of-the-art manufacturing facility in Warora, the top-of-the-line O-zone does not use CFCs. It comes equipped with a unique Health Guard with silver activated carbon fabric filter that not only eliminates odours but also inhibits bacterial growth. Other notable features of this model include a Medicine Box, where medicines and cosmetics can be stored separately in a detachable box, a Tomato/Coriander Bin for easy access and proper storing of delicate vegetables, a Can Zone for storing cans without consuming extra space and a unique freezer light that ensures ease while handling frozen food. All the shelves are designed to be spill-proof. A device called Digital Vigilante helps retain the freshness and life of food.

Website: [www.indiaonline.com](http://www.indiaonline.com)

## Training for technicians

IT Power India Pvt. Ltd., an implementing agency for the Ministry of Environment and Forests (MoEF), is expanding its activities. Under the aegis of MoEF, GTZ and UNDP, IT Power will now cover 16 states, apart from the existing four southern states. IT Power has been conducting various training programmes for technicians and service industry personnel on CFC technology, in addition to equipping them with proper equipment to remove CFCs used in fridges and air-conditioners.

Website: [www.financialexpress.com](http://www.financialexpress.com)

## Registration stipulated for CTC and HCFC users

The gazette notification dated 16th August 2004 issued by the Ministry of Environment and Forests (MoEF) stipulates the last date of registration for users of carbon tetrachloride (CTC) and hydrochlorofluorocarbons (HCFCs). While 31 December 2004 is the date fixed for substances listed in Group-IV of Schedule I, users of substances under Group-VI of Schedule I have to register on or before 19 July 2007. The Multilateral Fund has sanctioned US\$52 million as financial assistance to phase out CTC. Users of CTC can avail of this assistance by registering themselves. As per the terms of the Montreal Protocol, 85 per cent production and consumption of CTC of the base level for non-feedstock purposes has to be phased out within 01.01.2005. HCFCs are required to be phased out by the year 2040.

Website: [www.ozonecell.com](http://www.ozonecell.com)

## IN THE NEWS

### IMO urged to monitor sulphur emissions from ships

The International Convention for Prevention of Pollution from Ships (MARPOL) has called on the

International Maritime Organization (IMO) to monitor the worldwide average sulphur content of fuel once its Regulations for the Prevention of Air Pollution from Ships enter into force on 19 May 2005. MARPOL Annex VI, ratified by Samoa this year, stipulates the limits on sulphur oxide (SOx) emissions from ship exhausts and also prohibits deliberate emissions of ODS such as halons and CFCs. Apart from putting a global ceiling on the sulphur content of fuel oil, it also contains provisions which allow for special SOx Emission Control Areas to be established, where more stringent controls could be placed on sulphuric emissions. According to Annex VI, new installations containing ODS are prohibited on all ships while installations containing HCFCs are permitted until the year 2020.

Website: [www.202.186.86.35](http://www.202.186.86.35)

## New tools for ozone layer protection

In Indonesia, new equipment to facilitate adoption of an ozone-friendly production procedure were handed over to 13 refrigerator manufacturers by the Office of the State Minister for Environment and UNDP. The companies located in Batam, Medan, Tanjung Pinang and Greater Jakarta have committed to not use CFCs. To date, the technology conversion project has phased out consumption of 130 t/y of CFCs in the refrigeration manufacturing sector, out of a total target of 300 t/y. Indonesia is scheduled to reduce its total CFCs consumption by about 4,800 t.

Website: [www.thejakartapost.com](http://www.thejakartapost.com)

## Double success for ozone protection efforts

In China, an ozone protection project launched by UNDP has scored a double success. Caihong Group Co. has stopped Chinas largest tricolour television tube manufacturer from using CFC-113 and trichloroethane (TCE). This project helped the company reap an annual savings of US\$301,000. Started in July 1999, Caihong project is acclaimed as one of the best projects with great social and economic benefits implemented in China for ozone protection.

Website: [www.chinadaily.com.cn](http://www.chinadaily.com.cn)

## Honeywell breaks ground in China

Honeywell has announced its plans to build a manufacturing facility in China. This expansion follows the companys recent increase in HFC chemical manufacturing capacity in the United States. Apart from marking its presence in the Chinese market, the new facility would expand Honeywells globally integrated supply system for refrigerants. The plant will serve as the production and service centre in Asia for HFC refrigerants, like R-410a, R-407c and R-404a, which are eco-friendly alternatives to HCFC and CFC refrigerants. It will blend and package reliable, high-quality finished products tailored to meet the rapidly expanding and unique requirements of the air-conditioning and refrigeration industries in the region.

Honeywell has also signed an agreement with Haier Group, China, for a variety of products, which include R-410a refrigerant. Marketed as Genetron AZ-20, R-410a has become the globally accepted standard for use in new residential and light commercial air-conditioning units in Asia, Europe and the United States. AZ-20, a technological innovation from Honeywell, offers improved heat-carrying properties and allows equipment manufacturers to comply with increasingly higher energy efficiency standards.

Contact: Ms. Kyle Hultquist, Honeywell Asia-Pacific, China. Tel: +86 (21) 5257 4568, ext. 6111

E-mail: [kyle.hultquist@honeywell.com](mailto:kyle.hultquist@honeywell.com)

Website: [www.news.scotsman.com](http://www.news.scotsman.com)

## Low demand for CFC-free technology

High costs, low demand and limited knowledge are some of the factors plaguing manufacturers of CFC-free air-conditioning systems in Taiwan and mainland China. Some Taiwan suppliers have raised concerns regarding lower efficiency and a different maintenance procedure, compared with HCFC refrigerants, that is yet to be resolved. While some firms have R&D teams dedicated to mastering the application of CFC-free refrigerants, a few are also developing other alternative CFC-free refrigerants. Manufacturers have confined the use of R-410a and R-407c both CFC-free refrigerants are imported to products exported overseas. Apart from Europe, there is little demand even in other export markets like the United States, Japan and Australia.

Website: [www.globalsources.com](http://www.globalsources.com)

## New equipment for Maldives customs

In Maldives, detection and control of ODS has been reinforced through new equipment dispensed under the Refrigerant Management Plan, a joint project between the United Nations Environment Programme (UNEP) and the Environment Research Centre. The equipment, used by customs officials, will help identify elements containing substances like CFC-12 and HFC-143a being imported into the country. A workshop was also organized for customs officials to gain theoretical and practical knowledge with regard to the equipment.

Website: [www.maldivesinfo.gov.mv](http://www.maldivesinfo.gov.mv)

## Philippines beseeches citizens to protect ozone layer

On the occasion of the International Ozone Day, Environment Secretary Mr. Michael T. Defensor appealed to the public to do their bit in protecting the Earth's thinning ozone layer. A Walk for Ozone Layer had been organized by the Department of Environment and Natural Resources to mark this event. As a sidelight to the celebrations, a short story writing contest on this year's theme Save Our Sky: Ozone Friendly Planet, Our Target was also held. In addition, ODS-free products were exhibited to encourage the public to patronize eco-friendly products.

Website: [www.malaya.com.ph](http://www.malaya.com.ph)

## Alternatives to methyl bromide usage in Sri Lanka

As a signatory to the Montreal Protocol, Sri Lanka has to freeze ODS imports at the baseline level of 5.42 t, with a 20 per cent reduction by January 2005 and final phase-out by January 2015. A project has been initiated to enable adoption of effective, practical and economically feasible substitutes for non-quarantine and pre-shipment (non-QPS) purposes other than for growing high-value crops like flowers, ornamental plants, certified seed potatoes, vegetables and strawberries, and some stored products like timber, etc. This

project envisages the elimination of 3.25 ODP tonnes of methyl bromide (MB) utilized in agriculture and protection of stored products in the nation. Assessment of the alternatives includes technical and economic feasibility, and environmental implications, where possible, for the different applications.

Website: [www.ozonesrilanka.org](http://www.ozonesrilanka.org)

## Emissions of CFC substitutes less than predicted

The Japanese government has revised its 2010 forecast for emissions of three CFC substitutes to a 0.2 per cent increase from 1995 levels. The initial estimate was for up to 2 per cent growth. The forecast was revised in view of the governments increased subsidies to help develop new technologies to curb emissions of the three gases and tightening of a CFC recovery and destruction law.

Website: [www.japantimes.co.jp](http://www.japantimes.co.jp)

## New body set up to help eradicate ODS

In Sri Lanka, under the auspices of the National Ozone Unit (NOU), a new Environment Friendly Refrigeration Association of Sri Lanka (EFRASEL) has been established. NOU Director Dr. W.L. Sumathipala stated that a much-felt void in the environmental sphere with regard to ozone layer protection has been fulfilled by EFRASEL, which will work together with NOU, the local and international focal point.

According to NOUs schedule, use of CFCs would be completely phased out by the year 2010. The Ministry of Environment and Natural Resources hopes to reduce CFC imports to 118 t by 2005 and 30 t by 2007. EFRASEL will be the umbrella organization for accommodating industrialists, professionals, traders, technicians, training and vocational institutions, school children, end-users, etc. EFRASEL would be decentralized with its branches spread out in all the nine provinces of the country.

Website: [www.dailynews.lk](http://www.dailynews.lk)

## REFRIGERATION/AIR-CONDITIONING

### Refrigerator based on natural refrigerant

LG Electronics of Korea has offered a new ozone friendly refrigerator. The Linear DIOS refrigerator uses Isobutane, a kind of natural refrigerant. The compressor using Isobutane liquefies the gaseous refrigerant by compressing the gas, and during the process latent heat of vaporization lowers the system temperature. Isobutane can cause great amount of vaporization which reduces storing space, and also lowers noise while pressuring.

Value of hydrocarbon based refrigerants such as Isobutane is 30-40 percent higher than that of HFC-134a, but filling up quantity of Isobutane is only 42 percent compared to 91 percent of HFC-134a based on CFC-12 at 1000 percent, and pressure of compressor of Isobutane is much lower than HFC-134, which reduces consumption of electric power. However, Isobutane needs specific devices such as explosion-proof facilities, O-ring made of specific resins like fluorine rubber and NBR, and gasket due to its combustibility.

Contact: LG Electronics Inc., LG Twin Towers 20, Yeouido-dong, Yeongdeungpo-gu, Seoul, Korea 150-721.  
Tel: +82 (2) 3777 1114.

Website: [www.chemlocus.com](http://www.chemlocus.com)

## New range of air-cooled chillers

Carrier Corp., the United States, has launched a new range of air-cooled chillers, which build on the highly successful and innovative AquaSnap concept. The new systems cater to the large chiller segment, 240-1,400 kW (70-400 t). The AquaSnap design offers an optional, integrated hydronic kit, which includes a chilled water pump and associated piping and controls, as part of the chiller package. A modular design eliminates the need for additional plant floor space usually needed for the hydronic components. A high-efficiency design enables AquaSnaps components to work optimally by exploiting Puron refrigerants thermodynamic properties, which transfers heat more effectively than most commonly used refrigerant. Furthermore, AquaSnap achieves world-class performance in noise and is one of the quietest chillers in its category. Patented low-noise fans offer enhanced acoustics performance.

Contact: Ms. Margaret Gan-Garrison, Carrier Corp., United States of America. Tel: +1 (860) 6743 370

E-mail: [margaret.gan-garrison@carrier.utc.com](mailto:margaret.gan-garrison@carrier.utc.com)

Website: [www.carrier.com](http://www.carrier.com)

Website: [www.home.businesswire.com](http://www.home.businesswire.com)

## Greenest refrigerant

A new low-temperature refrigerant developed by Rhodia and Star Refrigeration, the United Kingdom, has been assigned a number by the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE). ISCEON 79, a non-ODS, non-inflammable and non-toxic refrigerant from Rhodia has been given the number R-422a and also recommended a safety classification of A1, subject to public review. ISCEON 79 offers food manufacturers the opportunity to reap significant energy savings without increasing capital costs. Developed as a substitute for present HFC alternatives and HCFC transitional blends, R-422a features 22 per cent lower global warming potential than R-404a and R-507.

Website: [www.nutraingredients.com](http://www.nutraingredients.com)

## New tool helps select ideal refrigerant

The National Institute of Standards and Technology (NIST), the United States, has designed REFPROP (versions 6 and 7), which provides highly accurate property data for pure refrigerants and refrigerant mixtures. Included in the database are the natural refrigerants carbon dioxide and ammonia, and propane, isobutane and other hydrocarbons. It also provides high-accuracy data for mixtures such as ammonia-water and most organic refrigeration mixtures. Transport properties and thermodynamic properties are provided in all fluid regimes, including compressed liquid and near critical states.

An interface is also available for both versions of REFPROP, allowing the NIST property database to be used with equation-solving and other features of EES, which provide properties for many pure refrigerants and a few refrigerant mixtures like R-407c, R-410a and ammonia-water. REFPROP program and F-Chart Software's EES/REFPROP interface is valuable for those involved in modelling/designing refrigeration systems. F-Chart has also designed interfaces for other NIST database programs, including NIST 4, NIST 12 and NIST 14.

Contact: F-Chart Software, Box 44042, Madison, WI 53744, United States of America. Tel: +1 (608) 2550 842; Fax: +1 (608) 2550 841

E-mail: [info@fchart.com](mailto:info@fchart.com)

Website: [www.fchart.com](http://www.fchart.com)

## Centrifugal chillers

Centrifugal chillers from Singapore's Hitachi Asia Ltd. operate using HFC-134a. The high-pressure refrigerant helps downsize and reduce the weight of the rotating body components compared with other refrigerant types. As such, the energy loss caused by rotation is reduced for consistent downsizing and high efficiency is achieved. A unique capacity control mechanism allows energy-saving operation throughout the year by stable capacity control in a wide range.

Contact: Hitachi Asia Ltd., Air-conditioning and Refrigeration Division, 16, Collyer Quay, #20-00 Hitachi Tower, Singapore 049318. Tel: +65 6231 2119; Fax: +65 6538 5305

Website: [www.hitachi.com.sg](http://www.hitachi.com.sg)

## CO2 heat pump for cold regions

Hokkaido Electric Power Co. Inc., Japan, is working on a carbon dioxide (CO<sub>2</sub>) refrigerant heat pump system to ensure stable performance in cold regions with little decline in efficiency, even under harsh winter conditions. Eco-Cute, a CO<sub>2</sub> heat pump water heater, has been designed for use by power companies and manufacturers/distributors. This system incorporates the heat source equipment and refrigerant piping system specifically developed for cold regions. It works sufficiently well even in cold regions and is commercially available from Sanyo Air-conditioners Co. Ltd.

Hokkaido is further developing a basic system that combines a room heater and water heater, based on technology acquired during the development of water heaters while measuring the heating capacity of the heat pump.

Contact: Hokkaido Electric Power Inc., 2, Higashi 1-chome, Ohdori, Chuo-ku, Sapporo, Hokkaido 060 8677, Japan. Tel: +81 (11) 2511 111

Website: [www.hepco.co.jp](http://www.hepco.co.jp)

## SOLVENTS

### Aerosol cleaner

HumiSeal of the United States is offering a new, patented aerosol cleaner and defluxer designed specifically as a replacement for similar products based on HCFC-141b. CircuitKleen 104 is effective both prior to the initial application of conformal coating and as a post-rework cleaner. The non-inflammable, non-ODS and non-corrosive cleaner rapidly removes oils, grease, silicones, dirt, grime, flux residues and other contaminants. Safe on most plastics, CircuitKleen evaporates rapidly without leaving behind any residues.

Contact: HumiSeal, Pittsburgh, PA 15338, United States of America. Tel: +1 (412) 8285 470 / (866) 8285 470; Fax: +1 (412) 8281 694

E-mail: [TechSupport@HumiSeal.com](mailto:TechSupport@HumiSeal.com)

Website: [www.humiseal.com](http://www.humiseal.com)

### Industrial cleaners and degreasers

Loctite India Pvt. Ltd., India, offers eco-friendly industrial grade cleaners and degreasers. The biodegradable, all-purpose, concentrated cleaners and degreasers is ODS-free. Formulated for wipe down, pressure spraying, ultrasonic and immersion cleaning processes, Natural Blue can be economically diluted with water at room temperature or heated to meet a wide range of industrial cleaning applications. It can be used to remove common industrial contaminants and process residues such as grease, cutting oils, light carbon, lubricants, tar, wax, etc.

Contact: Loctite India Pvt. Limited, Bangalore 560 005, Karnataka, India.

Website: [www.greatoffers4u.com](http://www.greatoffers4u.com)

### Fast solvent degreaser

K-Chem Inc., the United States, offers a fast drying, non-inflammable, non-conductive and non-ODS solvent degreaser. The fast solvent degreaser is methylene chloride-free and no residues are left behind. A unique feature of this solvent is the special dual action valving system, which allows for both a misting spray for broad area degreasing and a blasting spray for hard to reach areas and extra deposit removal power. Oil, dirt, grease and other deposits can be removed easily from electric motors, power equipment, conveyor/escalators, printing presses and virtually any metal equipment or parts cleaning. The multi-purpose industrial cleaner offers the benefit of dielectric strength for use on live electrical equipment.

K-Chem 2000 safety solvent is the next-generation solvent degreaser for industrial and electronics maintenance. This non-chlorinated formulation contains no known or suspected carcinogens or ozone depleters. It ensures powerful degreasing action and fast evaporation while remaining non-inflammable and non-conductive. It is safe for short-term contact on a wide variety of plastics, including HDPE, LDPE, polypropylene, phenolics, polyester, nylon, neoprene, natural rubber, etc. The low-odour and residue-free formulation is compatible with many metals, including most types of steel, galvanized steel, brass, copper, nickel, magnesium, tin plate, titanium, zinc, etc. It is also an excellent contact and circuit board cleaner for

removing deposits such as flux and ionic residues after soldering.

Solv-Klean is a fast drying, residue-free formulation that is safe on most plastics. The non-inflammable solvent features a dielectric strength of 26,000 V, no flash point, strong spray pattern and evaporates in 20 s. It can be used to remove oil, dirt, grease, condensation and moisture from circuit boards, precision instruments, oxygen equipment, controls, switches, motors and film. Solv-Klean has no CFCs or other ozone depleters.

Contact: K-Chem Inc., P.O. Box 530632, Birmingham, AL 35253 0632, United States of America. Tel: +1 (205) 5920 844; Fax: +1 (205) 5928 106

E-mail: [info@k-chem.com](mailto:info@k-chem.com)

Website: [www.k-chem.com](http://www.k-chem.com)

## New vapour degreaser

Greco Brothers Inc., the United States, offers a technologically advanced vapour degreaser, which is far more efficient than standard chlorinated solvent degreasers and is economically compatible with new-generation eco-friendly cleaning solvents. The high-performance vapour degreaser is designed specifically to use new solvents with the absolute maximum in vapour-retention efficiency. Key features of the high-performance degreasers include drop-seal cover, welded plumbing, shutdown cooling cycle, malfunction reporting, heating/cooling system, etc. They are designed to accept nearly any non-inflammable degreasing solvent, and can be used as either a single-solvent system or a co-solvent system.

Greco Brothers degreasing systems are designed to maximize cleaning effectiveness, operating efficiency and dependability. Custom-designed units are also available.

Contact: Greco Brothers Inc., 1, Greco Lane, Providence, RI 02909, United States of America. Tel: +1 (401) 4219 306; Fax: +1 (401) 2748 910.

Website: [www.grecobrothers.com](http://www.grecobrothers.com)

## Distillable solvent in-line cleaners

Trek Industries Inc., the United States, is offering cleaner conveyors for precision in-line cleaning with distillable solvents. The cleaners can be interfaced with continuous production lines and employ proven, state-of-the-art cleaning technology with minimal solvent consumption, thereby lowering operating costs. Customized pick and place can be provided for automatic loading and unloading of the cleaner conveyor. Standard features include:

Low-watt density electric heaters;

Spray-in vapour wash;

Hermetically sealed R-404a freeboard cooling;

High vapour level control;  
Touch screen operator interface;  
Liquid level monitoring in all process chambers;  
Front mounted emergency power off, stop switches; and  
PLC-based system controls.

Contact: Trek Industries Inc., 701 S. Azusa Ave., Azusa, CA 91702, United States of America. Tel: +1 (626) 8155 555; Fax: +1 (626) 8158 304

E-mail: [sales@trekindustries.com](mailto:sales@trekindustries.com)

Website: [www.trek-ind.com](http://www.trek-ind.com)

## Non-emulsifying cleaning solvent

Mycelx Technologies Corp., the United States, is offering an industrial strength solvent based on patented technology for unrivalled cleaning performance. The PowerSolve is designed to not emulsify in water so that separation is simple with standard gravity techniques or Mycelx cartridges and remediation products. Made from 100 per cent natural ingredients, PowerSolve is excellent for cleaning all types of oil, including heavy crude and asphalt. It does not contain carcinogenic or ozone depleting chemicals and is fully biodegradable.

Contact: Mycelx Technologies Corp., 961, Chestnut St., Suite 106, Gainesville, GA 30501, United States of America. Tel: +1 (770) 5343 118; Fax: +1 (770) 5343 117.

Website: [www.mycelx.com](http://www.mycelx.com)

## Chlorine-free solvent

SwanTek offers a chlorine-free cleaning solvent, Swansolv. This new-generation, fast evaporating, eco-friendly formulation is non-inflammable and possesses the best in solvency and soil loading capacity. This drop-in replacement for chlorinated solvents can be used in fully operational vapour degreasing and ultrasonic cleaners as well as for hand wiping. Key benefits include:

Removes quickly and easily a wide range of materials, including solder fluxes, metal-working fluids, adhesives, waxes, anti-seize compounds, greases, resins and oils;

It has a dielectric strength of 18,000 V and as such is ideal for in situ electrical motor cleaning;

Tested and accredited for cleaning to oxygen duty standards for both LOX and GOX; and

It conforms to ASTM and aerospace cleaning standards.

Contact: SwanTek.

E-mail: [swansolv@swantek.com](mailto:swansolv@swantek.com)

Website: [www.swantek.com](http://www.swantek.com)

## Stencil solvent

British Petroleum has developed Prozone stencil solvent for removing all types of soldering process residues from PCBs, screens, fixtures and equipment. Prozone is recommended for removing rosin flux residues from hand soldering, wave soldering and reflow processes. Rinsing in Prozone will yield clean assemblies. A final dip or quick rinse with isopropanol enables room temperature or low-temperature drying. The non-ozone depleting totally non-halogenated solvent is safe, and non-toxic, with low odour. Compatible with standard degreasers, batch cleaners and in-line cleaners, Prozone is an ideal cleaner for organics and ionics.

Website: [www.primedistributing.com](http://www.primedistributing.com)

## AEROSOLS

### Eco-friendly aerosol products

Maintex Inc., the United States, offers a complete line of environmentally safe aerosol products, from cleaners, polishes and air fresheners to industrial lubricants. Aerosols contain several essential components liquid product, propellant, valve and actuator. The product is delivered in the form of a spray with varying size droplets, depending on the function. Propellants, a key element in the formulation, can be liquefied or compressed gases. Typical aerosol propellants include dimethyl ether, liquefied petroleum gas and carbon dioxide.

Maintex aerosols include highly effective glass cleaner, furniture polish, stainless steel polish, disinfectants, dust mop treatment, air fresheners, carpet and upholstery spotters, chewing gum remover, oven cleaner and graffiti remover.

Contact: Maintex Inc., P.O. Box 7110, City of Industry, California 91746, United States of America. Tel: +1 (626) 9611 988; Fax: +1 (626) 9618 730.

Website: [www.maintex.com](http://www.maintex.com)

### HFA for pulmonary gene therapy

Researchers at the Welsh School of Pharmacy, the United Kingdom, have developed technology to produce drug nanoparticles for dispersion in hydrofluoroalkane (HFA) propellant for pulmonary gene therapy. Initially, pDNA is loaded into the aqueous pool of the reverse micelles that form when a water-in-oil microemulsion is formed between water, organic solvent and surfactant. Following removal of water and organic solvent, the

dimensions of the surfactant-coated particles and their ability to disperse in HFA propellants allow for the production of stable medicinal aerosols capable of deep pulmonary delivery by pMDI. The team is presently developing the surfactant system employed to provide for HFA dispersibility in the absence of co-solvent and to enhance cellular delivery of the pDNA.

Contact: Dr. James C. Birchall, Welsh School of Pharmacy, Cardiff University, Redwood Building, King Edward VII Ave., Cardiff CF10 3XF, United Kingdom. Tel: +44 (29) 2087 5815

E-mail: [birchalljc@cardiff.ac.uk](mailto:birchalljc@cardiff.ac.uk)

Website: [www.cf.ac.uk](http://www.cf.ac.uk)

## Aerosol formulations of peptides and proteins

In the United States, researchers for AstraZeneca AB have developed an aerosol formulation, which incorporates peptides and proteins, for treating patients. The aerosol formulation comprises a HFA propellant, a pharmaceutically active polypeptide dispersible in the propellant and a surfactant, which is C8-C16 fatty acid or salt thereof, a bile salt, a phospholipid, or an alkyl saccharide. Surfactants employed in this invention are suitable for use with HFA propellants and their capabilities for enhancement of systemic absorption of the polypeptide in the lower respiratory tract give them a dual function, making them especially beneficial for use in polypeptide aerosol formulations.

While the most preferred surfactants are bile salts, the propellant may also include one or more of 1,1,1,2-tetrafluoroethane (P-134a), 1,1,1,2,3,3,3-heptafluoropropane (P-227) and 1,1-difluoroethane (P-152a), for example, optionally in admixture with one or more other propellants. The polypeptide may be any medically or diagnostically useful peptide or protein of small to medium size i.e. up to about 40 kD molecular weight for which systemic delivery is desired. In addition to drug, propellant and surfactant, a small amount of ethanol (about 5 per cent but possibly up to 20 per cent by weight) may be included in the formulations. Ethanol is commonly included for improving the function of the metering valve and in some cases to raise the stability of the dispersion. The composition may contain other additives as needed, including other pharmaceutically active agents, adjuvants, carriers, flavouring agents, buffers, antioxidants, chemical stabilizers, etc.

Website: [www.pharmcast.com](http://www.pharmcast.com)

## HFA-227 and -134a in pharmaceutical formulation

Chiesi Farmaceutici S.p.A. has obtained a United States patent for its pharmaceutical aerosol composition containing HFA-227 and HFA-134a. This breakthrough in particular relates to aerosol compositions for use in pressurized metered dose inhalers (MDIs) and also to solution aerosol compositions, wherein the propellant comprises HFA-134a or HFA-227 or their mixtures.

EP 504112 relates to a pharmaceutical aerosol composition free from CFCs containing a propellant, one or more pharmaceutical active ingredients, a non-ionic surfactant and optionally other conventional pharmaceutical auxiliaries suitable for aerosol formulations comprising solvents having a higher polarity than the propellant, other non-ionic surfactants as valve lubricants, vegetable oils, phospholipids and taste masking agents. DE 4123663 describes a medical aerosol composition containing a dispersion or suspension of an active agent together with a compound with surface-active or lipophilic properties, heptafluoropropane as

propellant and an alcohol like ethanol and/or propylene glycol. EP 384371 describes a propellant for an aerosol, comprising pressure-liquefied HFA-227 in a mixture with pressure-liquefied propane and/or n-butane and/or isobutane and/or dimethyl ether and/or 1,1-difluoroethane. EP 0553298 describes an aerosol formulation comprising a therapeutically effective amount of beclomethasone 17,21 dipropionate; a propellant incorporating an HFC selected from the group that includes HFA-134a, HFA-227 and a mixture thereof, and ethanol in an amount effective to solubilize the beclomethasone 17,21 dipropionate in the propellant.

Website: [www.pharmcast.com](http://www.pharmcast.com)

## Medicinal inhalation aerosols containing budesonide

3M Innovative Properties Co., the United States, has developed a pharmaceutical aerosol formulation suitable for administration by oral or nasal inhalation. It contains a suspension of particulate budesonide, HFA propellant and, optionally, additional HFA propellants, surfactants selected from oleic acid, sorbitan oleates and lecithin, and adjuvant have a Kauri-butanol value of at least 10. It has been found that it is possible to achieve stable suspensions of particulate budesonide by using a mixture of HFA propellants by matching the density of the propellant mixture to be substantially identical to the density of budesonide. The particles preferably have an average size in the range 1 to 10  $\mu$ m. In addition to its use for the control of asthma, budesonide is also suitable for nasal delivery in the treatment of allergic rhinitis. Budesonide particles sink when suspended in 100 per cent HFA-134a but float in 100 per cent HFA-227.

Website: [www.pharmcast.com](http://www.pharmcast.com)

## FOAMS

### CO<sub>2</sub> as sole blowing agent

Chemically manufactured carbon dioxide (CO<sub>2</sub>), produced by water and isocyanate reaction, has long been established as a blowing agent for polyurethane (PU) foams, usually together with other ancillary blowing agents. Now technology is available wherein the objective is to utilize added, not chemically produced, CO<sub>2</sub> to substitute traditional blowing agents. Impianti OMS, Italy, has developed two processes. In the first, CO<sub>2</sub> is handled in a liquid state throughout the process while in the second process CO<sub>2</sub> is metered and blended in a gaseous state. Of these two, pre-blending of gaseous CO<sub>2</sub> provides the best combination of benefits as it is cost-effective, can be retrofitted to existing equipment and is reliable and accurate in service.

The OMS system comprises a pre-mixing device that incorporates a 12 bar rated pressure and temperature controlled tank, static mixing unit, CO<sub>2</sub> flow control and a special system to precisely measure the total quantity of CO dissolved in the material. Key benefits include:

Low investment cost;

Good production reliability;

Different mixing heads can be easily operated at various outputs; and

Low equipment and control complexity.

Contact: Impianti OMS, Via Sabbionetta 4, 20050 Verano Brianza (Mi), Italy. Tel: +39 (362) 9831; Fax: +39 (362) 983 217

E-mail: [impianti.oms@omsgroup.it](mailto:impianti.oms@omsgroup.it)

Website: [www.omsgroup.it](http://www.omsgroup.it)

## Thermal conductivity of XPS foam evaluated

In the United States, Dow Chemical Co. has evaluated the thermal conductivity of extruded polystyrene (XPS) foam blown utilizing various halogenated blowing agents, including HFC-134a and HCFC-142b. Residual blowing agents were measured after ageing up to 26 years. Diffusive transport properties of the blowing agents were determined through mathematical calculation of the heat transfer in the gas phase component of the foam thermal conductivity. These values were used in a Dow model, which allows accurate projection of the long-term thermal resistance of XPS foams blown with CFC-12, HCFC-142b, HCFC-22, HFC-134a, HFC-152a and CO<sub>2</sub>.

Excellent agreement was obtained between the measured and predicted thermal conductivity values, with samples stored in lab conditions and also samples extracted from field conditions, like cellar and upside-down roof applications. Results confirm the slow diffusion rate of CFC-12, HCFC-142b and HFC-134a through XPS foam and prove that HFC-134a or HCFC-142b blown XPS foams fulfil the requirement for applications requiring excellent long-term insulation performance needs.

Contact: Mr. Andrew N. Paquet, Dow Chemical Co., 1605, Joseph Drive-200 Larkin, Midland, MI 48674, United States of America.

Website: [www.cel.sagepub.com](http://www.cel.sagepub.com)

## High-pressure PU dispensing unit

Rim Polymers Industries Pte. Ltd., Singapore, offers GMA high-pressure polyurethane (PU) dispensing unit for cyclopentane systems. The new unit is capable of processing cyclopentane as a blowing agent in the appliance industry. It offers a modular and flexible solution for various PU needs.

GMA cyclopentane/polyol premix metering unit, model PX40 Mix, is a premixing system used for blending raw polyol and blowing agent in the appliance industries. This system is specially designed to ensure correct and precise blending of cyclopentane (blowing agent) with the polyol chemical. GMA PX40 Mix has to be integrated with the gas warning detection system supplied separately.

Contact: RIM Polymers Industries Pte. Ltd., 209, Henderson Rd., #03-08, Henderson Industrial Park, Singapore 159551. Tel: +65 6278 3288; Fax: +65 6271 0426/6274 5242

E-mail: [rim\\_polymers@cehgp.com.sg](mailto:rim_polymers@cehgp.com.sg)

Website: [www.rimpolymers.com](http://www.rimpolymers.com)

## Liquid foaming agent for plastic foams

Solvay Fluor, Germany, has developed a ODS-free liquid foaming agent for manufacturing plastic foams. The Solkane R 365 mfc is used as a base material for a wide range of blowing agent blends for plastic foams, industrial solvents and heat transfer fluids. Polyurethane foams produced with Solkane R 365 mfc have a fine cell structure with good insulation properties and a good compressive strength. Solkane R 365 mfc is used for demanding PU foams where high insulation properties or fire proof or safety during application is needed.

Solkane R 365 mfc is a liquid hydrofluorocarbon without any ozone depletion potential. It is a colourless liquid, chemically stable, and faintly ethereal in odour. Solkane R 365 mfc has a good miscibility with other solvents (e.g. acetone, ethanol, pentane, fluorinated compounds). Two life cycle assessments have confirmed that Solkane R 365 mfc product systems can be more eco-efficient than alternative solutions.

Contact: Solvay Fluor und Derivate GmbH, P.O. Box 220, D-30002, Hannover, Germany.

Website: [www.solvay-fluor.com](http://www.solvay-fluor.com)

## New blending unit for processing PU

Linden Industries Inc., the United States, offers a pentane blending unit that replaces HFC and HCFC blowing agents with pentane hydrocarbon. Penta-Fusion has been engineered and produced to customer specifications. It is normally used in discontinuous applications requiring poured shots. Blended material from the unit may be piped directly to properly equipped day tanks or batch holding tanks for storage and distribution to day tanks. The company also offers an Environmentally Friendly Blender, which can be used for R-134a, R-245fa or R-22. This self-contained unit can be provided with new equipment or as a retrofit.

Penta-Meter is a metering unit for pentane injection at the mix-head. Typically used for continuous production lines, this system is engineered and manufactured to suit customer specifications. Speciality power requirements are available for machine export. If equipped with the optional HOTLINE Modem Service Support System, a rapid machine analysis can be performed in almost any corner of the globe.

Contact: Linden Industries Inc., 137, Ascot Parkway, Cuyahoga Falls, Ohio 44223, United States of America.  
Fax: +1 (330) 9281 854.

Website: [www.linden-emb.com](http://www.linden-emb.com)

## HALONS

### Vehicle fire suppression system

Nautical Fire Suppression Ltd., the United States, offers Aero-K systems for highly effective and eco-friendly fire suppression in enclosed facilities and local spaces. These systems eliminate the need for pressure vessels, pipe work and extensive installation labour. The aerosol generators are virtually maintenance-free. The potassium-based extinguishing agent is five times more effective than halon. Primary extinguishment mechanism is chemical interference with free radicals of flame, which interrupts the propagation of fire. Notable features include:

Suitable for Class A (surface), B and C fires;

Extinguishing concentration: 62 g/m<sup>3</sup> for class B fires;

Generator sizes to fit any hazard;

EPA-approved halon replacement;

Control panel operation 12 or 24 V;

Manual discharge from control unit;

Heat sensor cable for detection; and

Easy installation.

Contact: Nautical Fire Suppression Ltd., United States of America. Tel: +1 (705) 4247 519; Fax: +1 (705) 7152 186

E-mail: [info@nauticalfire.com](mailto:info@nauticalfire.com)

Website: [www.interlinksolutions.com](http://www.interlinksolutions.com)

## Halon banking and recycling

Kidde Aerospace, the world leader in aircraft fire extinguishing and suppression technology, offers a cost-effective means to capture and reuse halon-1301 and -1211 for aircraft fire extinguishers, inerting tanks and other halon containing vessels. Notable benefits of the REcovery And Conditioning for Halon (REACH) system include:

Recovers halon-1301, -1211 and other halocarbons;

Up to 98 per cent recapture rate, with little lost to the atmosphere;

A closed loop system, operating at over 99 per cent recovery efficiency;

Interfaces with aircraft or halon vessels;

Most environmentally friendly and cost-efficient system presently available; and

Complete automatic purge capability, preventing cross-contamination of agents.

Contact: Kidde Aerospace and Fenwal Safety Systems, 4200, Airport Drive NW Wilson, NC 27896, United States of America. Tel: +1 (252) 2377 004; Fax: +1 (252) 2467 181.

Website: [www.walterkidde.com](http://www.walterkidde.com)

## Water look-alike extinguishes fires

Wormald, a leading provider of fire protection systems, has introduced a ground-breaking system in New Zealand. SAPPHIRE fire suppression system is a revolutionary technology utilizing a new sustainable chemical agent that fights fires without causing any damage to electronics, works of art, irreplaceable artefacts, documents and other critical assets. This system is quicker, cleaner, safer and has an atmospheric lifetime of five days. SAPPHIRE system works by chemically interfering with the fire combustion process, bringing it to a halt, normally before the fire breaks out in flames. It works faster than conventional water sprinkler systems, which are designed to operate after a fire actually breaks out.

NOVEC 1230 fire protection fluid used in the SAPPHIRE system looks just like water, but does not cause the type of damage usually associated with water when extinguishing a fire. Stored in pressurized containers as a liquid, the extinguishing agent vaporizes when discharged. The flexible and sophisticated fire suppression system greatly lowers actual fire damage by suppressing a fire in the pre-combustion stage. It can be used in central storage and modular design solutions that work in tandem with existing building fire alarm and suppression systems, providing ideal building structure protection.

Website: [www.scoop.co.nz](http://www.scoop.co.nz)

## FUMIGANTS

### Genomics approach for controlling nematodes

Researchers at Divergence Inc. are developing safe and effective nematode control technologies as replacements to methyl bromide (MB) alternatives. Based on a comparative and functional genomics pipeline selecting for genes both specific and essential to nematodes, the research team has developed several targets that are amenable to chemical inhibition.

Divergence lead chemistry, DC7651 and other molecules in this class, mimics the natural substrate of one of the lead enzyme targets, DIV8338. In greenhouse assays DC7651 has demonstrated efficacy in soil against *Meloidogyne incognita*, *Heterodera glycines* and *Belonolaimus longicaudatus*. DC7651 is the synthetic derivative of a naturally occurring plant metabolite with a favourable regulatory pathway based on the mammalian and non-target species safety profile of the compound and class. Divergence is presently working to optimize commercially viable formulations and the mode and frequency of delivery for optimum efficacy. Additional leads from this class are also being tested.

Website: [www.mbao.org](http://www.mbao.org)

## Greenhouse production using soil-less media

Researchers in the United States report that the use of soil-less culture in greenhouses is a valid alternative to the use of methyl bromide (MB). Apart from avoiding problems associated with soil fumigation, vegetables grown in protected culture are of high quality and yields up to 10 times higher can be achieved. In recent years, imports of greenhouse grown produce especially speciality tomatoes and coloured peppers into the United States have increased. Globally, greenhouse production of vegetable crops has replaced commercial field production. The area dedicated to greenhouse production has increased substantially over the last decade and is continuing to expand. Contact: Mr. Philip Stansly, SWFRECC, Immokalee, FL 34142, United States of America.

Website: [www.mbao.org](http://www.mbao.org)

## Eco-friendly fumigation

The increasing use of wooden packaging materials has led to more and more countries tightening controls on the import of such materials to lower the risk of introduction and/or spread of quarantine pests. The International Plant Protection Convention introduced a worldwide standard for the treatment of wooden packaging material, ISPM no. 15, to create a univocal policy. This standard describes phytosanitary measures for wood by means of heat treatment or methyl bromide (MB).

EcO2 BV, the Netherlands, offers natural treatments that eliminate the need for MB. All wooden packaging materials can be heat treated in compliance with the international regulation. EcO2 QPS treatment is a combination of heat and low oxygen. The proprietary system was specifically developed for containers, general cargo and big bags, that contain wooden pallets, packaging materials and dunnage. The wood is marked and certified after treatment. Within 24 h, the wood and packaging materials together with the goods can be treated.

Contact: EcO2 BV, the Netherlands. Tel: +32 (3) 5415 322.

Website: [www.eco2.nl](http://www.eco2.nl)

## Metam and chloropicrin combinations

Tests undertaken by Amvac Chemical Corp., the United States, have shown that metam sodium (VAPAM) and metam potassium (K-PAM) with other fumigants, particularly chloropicrin, can replace methyl bromide (MB)/chloropicrin fumigants. Control of nutsedge, annual weeds, nematodes and soil-borne diseases has been generally good. Metam offers excellent application flexibility and is effectively applied worldwide by methods such as chemigation, drip irrigation, incorporation with a rototiller and injection into the soil with various shank spacing/depth arrangements to control a broad spectrum of pests. One of the most consistent application programmes is a combination of chloropicrin and metam as follows:

Chloropicrin is shank-injected into the bed at a rate of about 57-68 kg/acre and is immediately covered with plastic mulch;

Drip lines are laid prior to the plastic mulch being applied. Two drip lines are used on bed widths of 32-36 inches;

5-7 days after application of chloropicrin, metam is applied through the drip system at high end use rates; and

A minimum of 1 acre-inch of water is used for the application and the drip system is designed to deliver this amount of water in about 4-8 hours.

Benefits of this programme include:

Consistent overall performance owing to more complete bed coverage and the combined effect of both products on key pests;

Chloropicrin makes nutsedge more susceptible to the following sequential metam application by sacrificing the nutlets and allowing entry of MITC for more complete control;

Workers are generally not needed in the field during or after application to adjust plastic mulch or perform other tasks, so issues with Personal Protective Equipment are minimized; and

Application of metam through drip irrigation effectively minimizes odour or off-gas problems. Preliminary results indicate that this combination holds considerable potential as a viable MB/chloropicrin alternative.

Website: [www.mbao.org](http://www.mbao.org)

## Methyl bromide alternative to control weeds in turf

In the United States, researchers from Auburn University and Alabama Agriculture Experimental Station have tested the use of acrolein (2-propenal) and propylene oxide as alternatives to the use of methyl bromide (MB) for weed control in turf. Weed species typically include common bermudagrass (*Cynodon dactylon*), perennial sedges (*Cyperus* and *Kyllinga* spp.) and several annual grass and broadleaf species. Preliminary results indicate that acrolein application rates are similar to that of MB and these rates are effective in controlling yellow nutsedge (*Cyperus esculentus*).

Both acrolein and propylene oxide were evaluated separately in micro-chamber experiments using 10 cm diameter PVC pipes cut to a length of 25 cm. The bottoms were sealed while the tops were removable. Each compound was tested twice and data pooled for analysis. Results indicate that both compounds have potential use as MB alternatives. Field studies are under way to substantiate these results.

Website: [www.mbao.org](http://www.mbao.org)

## Phosphine to control pests of export logs

Researchers in New Zealand have tested the use of phosphine as a fumigant to control black pine bark beetle (*Hylastes ater*) and burnt pine longhorn beetle (*Arhopalus ferus*), major pests of *Pinus radiata* logs. Trials were undertaken to determine the efficacy of phosphine in eliminating these pests from *P. radiata* logs at egg, larva and adult life stages.

For *H. ater* three phosphine concentrations (200, 700 and 2,000 ppm), each replicated four times, were compared with a zero concentration control, for which there were only three replicates. This experiment was

carried out twice. *A. ferus* adults were treated with two phosphine concentrations (700 and 2,000 ppm), replicated four times, which were compared with a control treatment (three replicates). *A. ferus* eggs were treated with two phosphine concentrations (100 and 200 ppm) and compared with an untreated control. There were four replicates of the phosphine treatments and control. Experiment results have shown that direct exposure to phosphine at levels as low as 200 ppm for up to 10 days effectively disinfested all the three life stages of both pests.

Website: [www.hortnet.co.nz](http://www.hortnet.co.nz)

## Modified atmosphere as an MB alternative

In Turkey, modified atmosphere has been used as an alternative to methyl bromide (MB) in the dried fig sector. A study was conducted to evaluate the effectiveness of high carbon dioxide (CO<sub>2</sub>) applications for eradication of dried fig pests in field conditions. In a series of experiments, CO<sub>2</sub> fumigation of dried figs was performed in flexible storage units (36 m<sup>3</sup> capacity) over five days of exposure period. The units were loaded with about 15 t of dried figs in perforated plastic boxes. *Ephesia cautella*, *Plodia interpunctella* and *Oryzaephilus surinamensis* were introduced in perforated PVC containers. Heavily infested figs with the mixed life stages of *Carpophilus hemipterus* and *Carpoglyphus lactis* were also introduced. The units were equipped with temperature/humidity loggers. CO<sub>2</sub> from steel cylinders were flushed into the units from the base section of the cubes. CO<sub>2</sub> and oxygen (O<sub>2</sub>) gas concentrations in the PVC units were monitored daily using an analyser equipped with a thermal conductivity detector and electrochemical detector for the entire exposure period.

Results showed that O<sub>2</sub> concentrations in the containers decreased below 1 per cent and CO<sub>2</sub> concentrations decreased above 95 per cent. Mortality records indicated that the main pests of dried figs were completely eliminated by high CO<sub>2</sub> applications in gas-tight conditions after five days of exposure.

Contact: Mr. M. Emekci, Ankara University, Faculty of Agriculture, Dept. of Plant Protection, 06110 Ankara, Turkey.

E-mail: [emekci@agri.ankara.edu.tr](mailto:emekci@agri.ankara.edu.tr)

Website: [www.mbao.org](http://www.mbao.org)

## Safe MB replacement

Aberco Inc., the United States, has tested the use of 100 per cent propylene oxide (Propozone) as a soil fumigant. Results accumulated over the past four years indicate that this fumigant can be a safe replacement for methyl bromide (MB). Propozone has been shown to be effective against all known soil pathogens like nematodes, weeds (nutsedge, etc.) and fungal pathogens. Shank injection is the preferred application method, particularly in warm climates and to treat deep nematodes. Either application through drip tapes or shank injection works well against weeds and fungal plant disease.

Website: [www.mbao.org](http://www.mbao.org)